

The safety and utility of magnetic resonance imaging in a patient with conventional cardiac resynchronization therapy device

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The use of magnetic resonance imaging (MRI) in patients with conventional pacemakers and cardioverter defibrillators has been limited by manufacturers due to safety reasons. Because of the complexity of issues involved with these devices, MRI should only be considered when alternative imaging modalities will not provide sufficient information.¹ The use of MRI in radiotherapy and surgery planning has been rapidly gaining popularity.² MRI provides high-quality imaging and superior soft-tissue contrast in comparison with computed tomography (CT), allowing a better definition of organ and tissue abnormalities. The lack of additional radiation exposure provides another attractive feature for intratreatment imaging. In addition, diffusion-weighted, dynamic contrast-enhanced, intrinsic susceptibility-weighted, and other MRI techniques allow a more advanced characterization of cancer biology by providing

quantitative functional parameters such as tissue cellularity, vascular permeability/perfusion, and hypoxia. Despite limitations imposed by manufacturers, some cardiology referral centers perform off-label MRI with an excellent short- and medium-term safety profile, providing interpretable images that frequently influence clinical care.³

A 57-year-old woman after implantation of conventional (non-MRI-compatible) cardiac resynchronization therapy device (CRT-D) in 2014 for secondary prevention of sudden cardiac death and heart failure with reduced ejection fraction was referred for MRI due to progressive spastic paraparesis of the lower extremities since January 2017. Due to contraindications to MRI related to noncompatible implant, a spinal CT scan was performed as a method of choice, which showed moderate degenerative changes and discopathy at all spinal levels (FIGURE 1A and 1B). However,

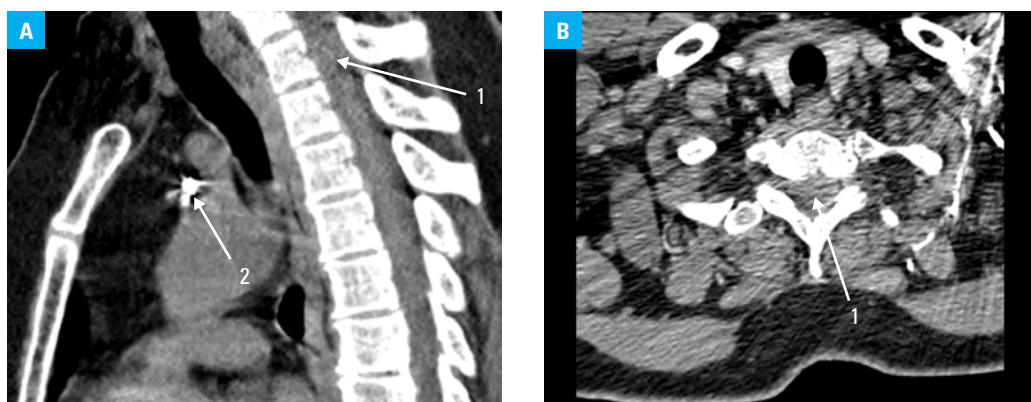
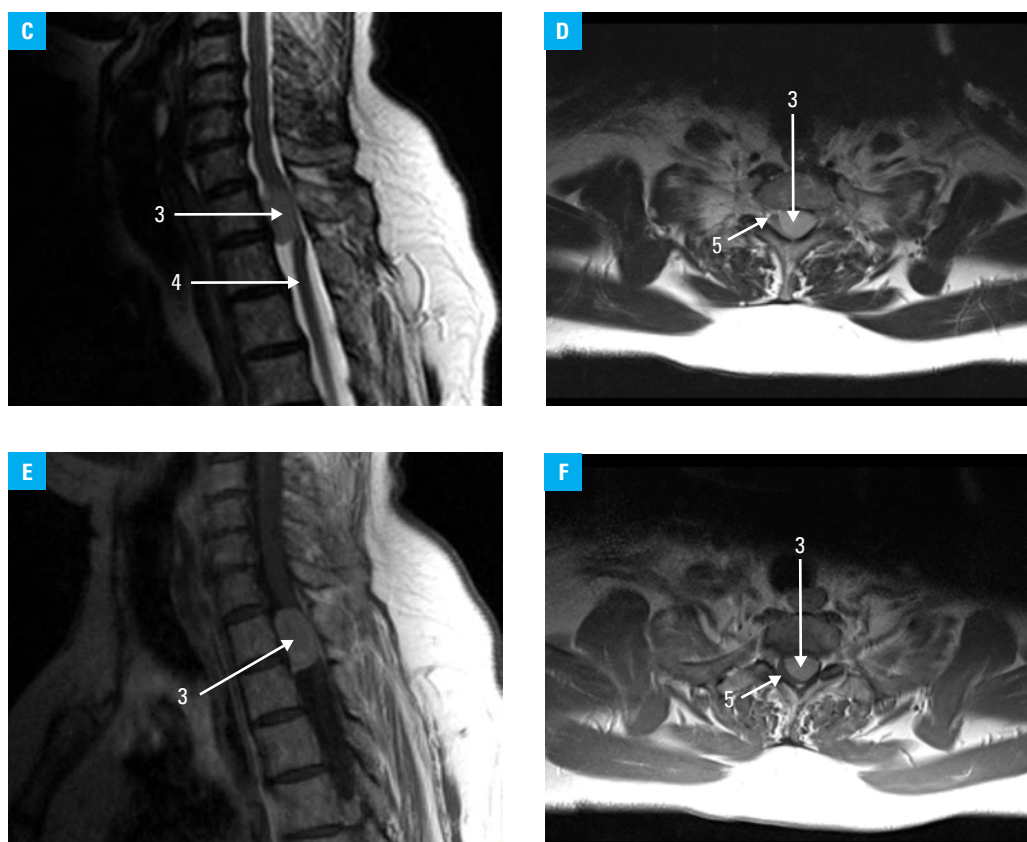


FIGURE 1 Imaging of the spine; **A** – contrast-enhanced computed tomography, sagittal view; **B** – contrast-enhanced computed tomography, transverse view; arrow 1, vertebral canal at the T1–T2 level; arrow 2, endocardial lead artifacts

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FIGURE 1 **C** – T2-weighted magnetic resonance image, sagittal view; **D** – T2-weighted magnetic resonance image, transverse view; **E** – T1-weighted magnetic resonance image with contrast, sagittal view; **F** – T1-weighted magnetic resonance image with contrast, transverse view; arrow 3, a tumor at the T1–T2 level; arrow 4, spinal cord; arrow 5, spinal cord compressed by tumor



the pathology leading to symptoms has not been identified. The patient was referred for MRI after appropriate reprogramming of the CRT-D. The MRI of the thoracic segment revealed a lesion at the T1–T2 level of the spinal canal (**FIGURE 1C–1F**). Oval smooth contours with a wide base adhered to the meninges and showed intense, homogeneous contrast enhancement. Radiologically, the tumor revealed features of a meningioma, which filled the majority of the spinal canal lumen and significantly compressed the spinal cord. A minor tumor of similar type was revealed in the posterior part of the spinal canal at the T10 level. After the scan, the CRT-D device check was performed. The device worked properly and neither inappropriate shock nor inappropriate pacing were observed. The patient was referred for a neurosurgical operation. After surgical removal of the tumor and rehabilitation, the neurological state of the patient has improved considerably. At 1-month follow-up, no significant changes were observed in CRT-D parameters. A histological examination confirmed meningioma.

In conclusion, off-label MRI in a patient with non-MRI-compatible device performed under a strict protocol demonstrated excellent short- and medium-term overall safety, while providing interpretable images that influenced clinical care.

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